

Converged Plantwide Ethernet (CPwE) Reference Architectures

June 17th, 2020

Introductions

Brandon Singh

Presenter
Network Specialist
The Reynolds Company
– Dallas / Fort Worth

Brian Mikeska

Panelist
Automation
The Reynolds Company
– Houston

Joe Belaschky

Presenter
Automation / Network
Specialist
The Reynolds Company
– Houston

Mark McGinnis

Panelist
Automation Specialist
The Reynolds Company
– Dallas / Fort Worth

2020 Online Events - Register to receive a calendar invite

User Group

Thursday, June 18

ControlLogix Redundancy
10:00 am

Tech Talks

Tuesday, June 23rd

Industrial Networking Series Part 6:
Securing Control System Network
with CIP Security
10:00 am

Wednesday, June 24th

Bulletin 931 Signal Conditioner / 937
IS Barriers
10:00 am

Wednesday, July 1st

Automatic Device Recovery with
Powerflex Drives
10:00 am

<https://www.reynoldsonline.com/eventsUnit.action>

Converged Plantwide Ethernet (CPwE) Reference Architectures

High-level Overview

Collection of Architected, Tested & Validated Designs for
Industrial Applications (Manufacturing & Heavy Industries)

Agenda

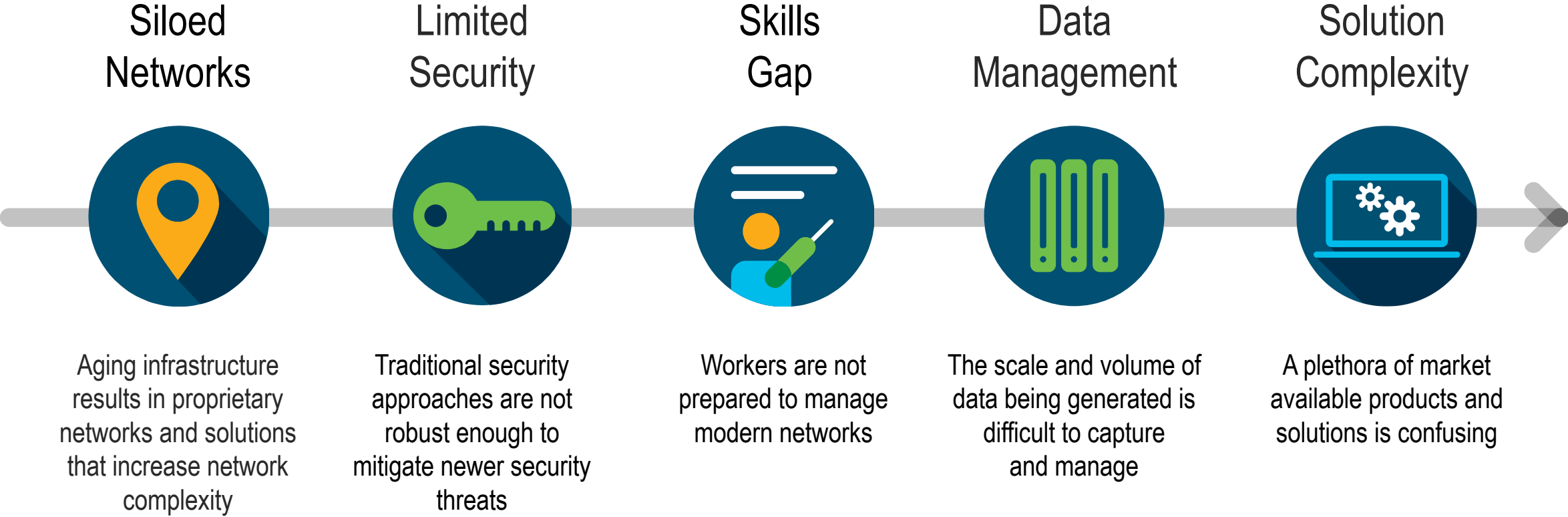
- > Cisco / Rockwell Automation Strategic Alliance
- > Challenges Associated with Converged Architectures that CPwE Helps to Address
- > Customer Feedback: OT/IT Value Statements - What We Do Together
- > Overview: Converged Plantwide Ethernet (CPwE) Reference Architectures
- > Key Tenets of CPwE Architectures
- > What's New / Key Takeaways/ Additional Material

Cisco / Rockwell Automation Strategic Alliance

Market pressures are putting productivity and profitability at risk for industrial operations



Modernization is complex and must address numerous pain points

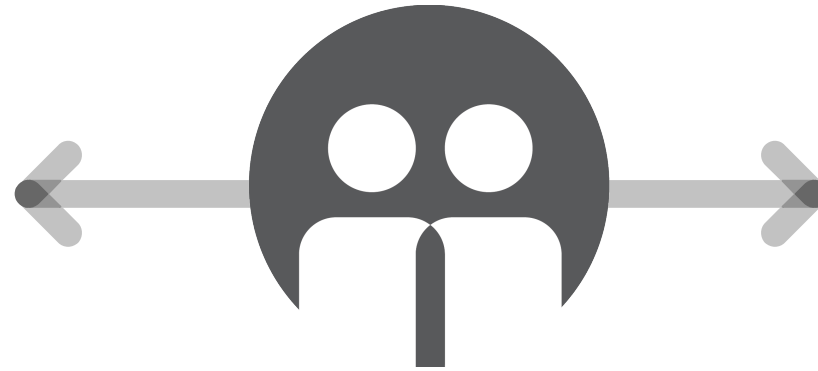


Together, Cisco and Rockwell Automation can help

Leading digital transformation for The Connected Enterprise with industrial ready, world-class control, power and information systems and IT networking and security technologies



Worldwide leader in IT networking and security



Global leader in industrial control, power and information solutions



Trusted domain experts with a strategic alliance



Committed to future industry success

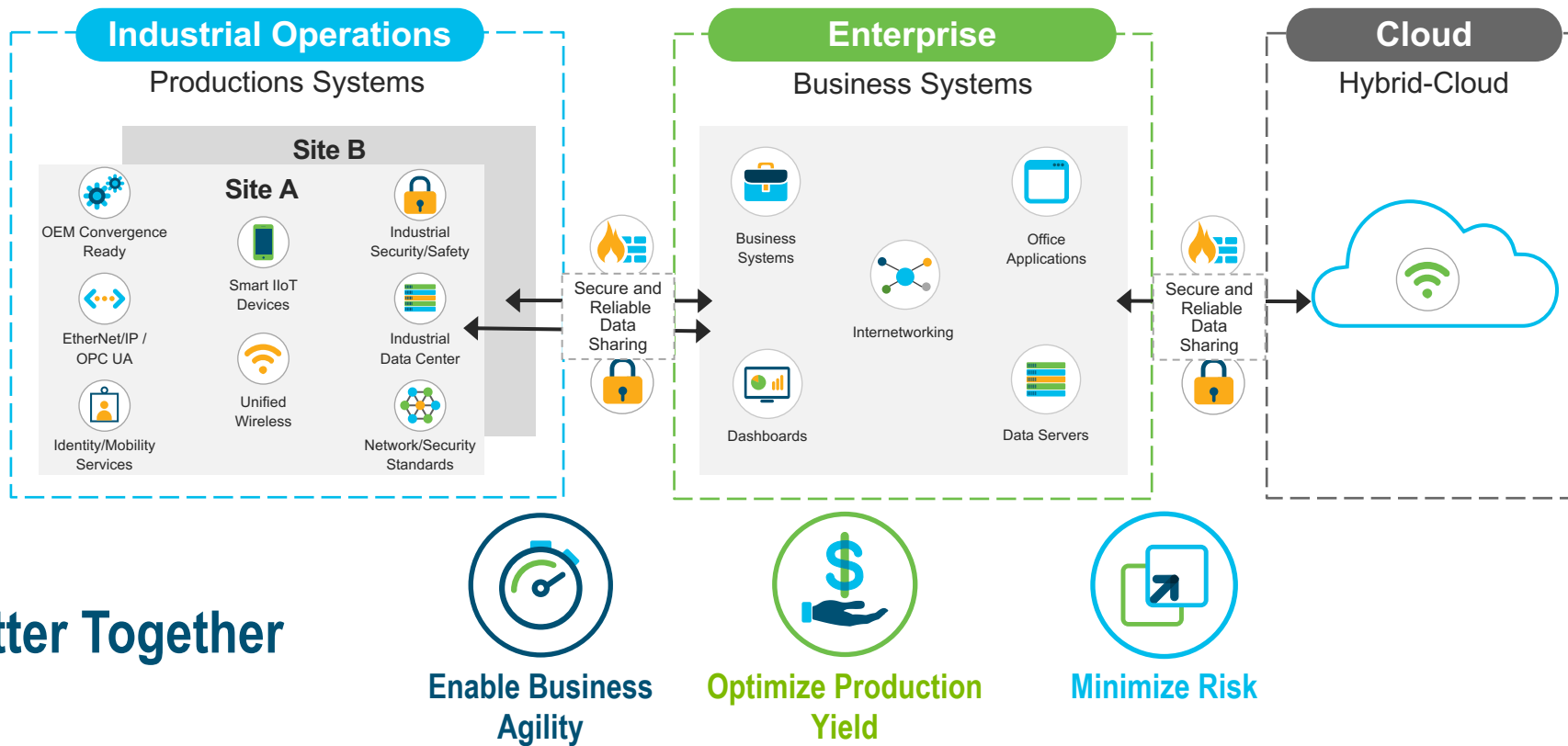


Dedicated to developing ground-breaking solutions

Introducing Converged Plantwide Ethernet (CPwE), a holistic blueprint for digital transformation



The CPwE Converged Network Architectures



Better Together

Collection of architected, tested and validated network and security designs

Simplify network and security design by connecting industrial operations and business systems

An open solution that adheres to regulatory standards creates flexibility and scalability

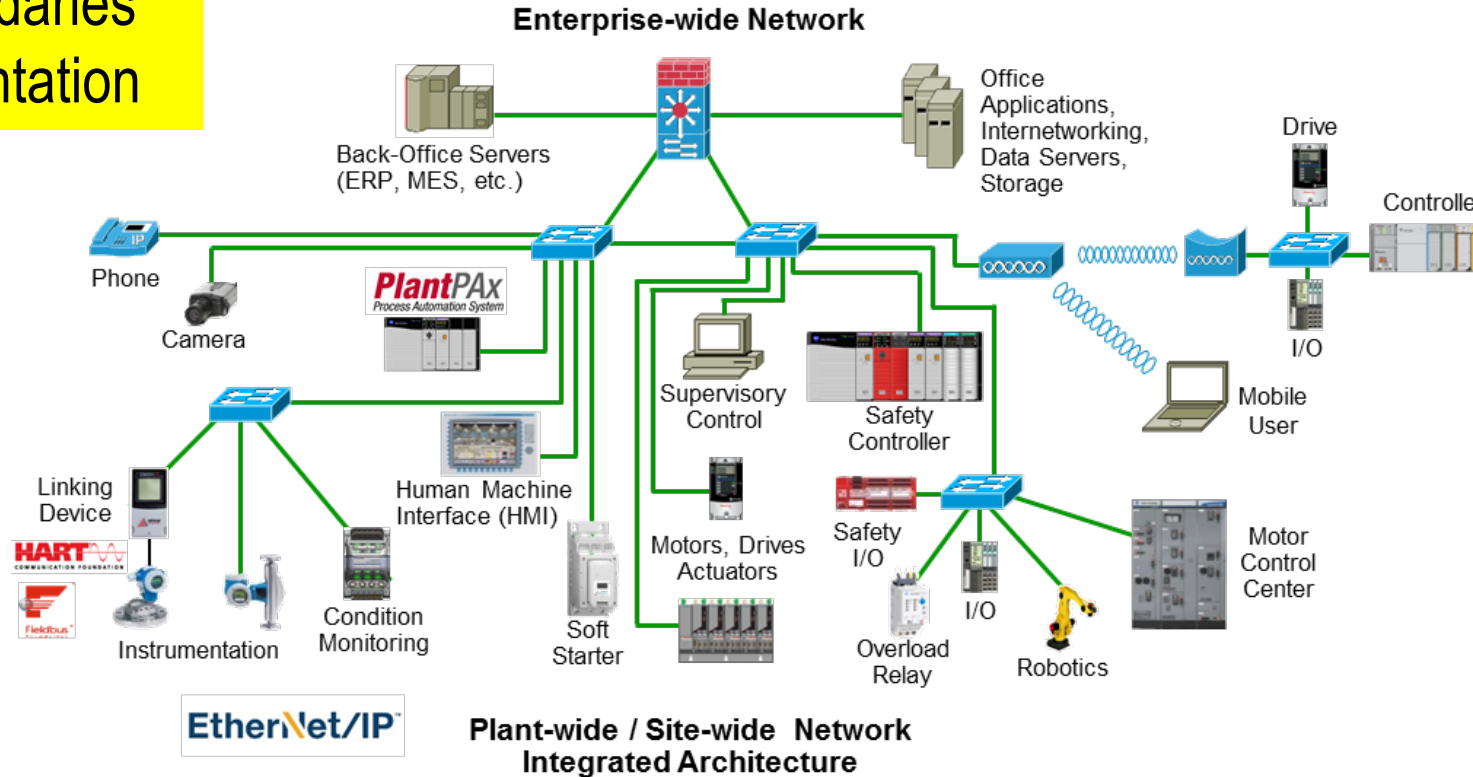
A converged infrastructure built on a common architecture framework makes the network data-ready

Challenges Associated with Converged Architectures that CPwE Helps to Address

Industrial IoT (IIoT) – IACS Convergence

Challenges Associated with Converged Architectures that CPwE Helps to Address

Creates Larger LANs,
Lacks Natural Boundaries
and Natural Segmentation

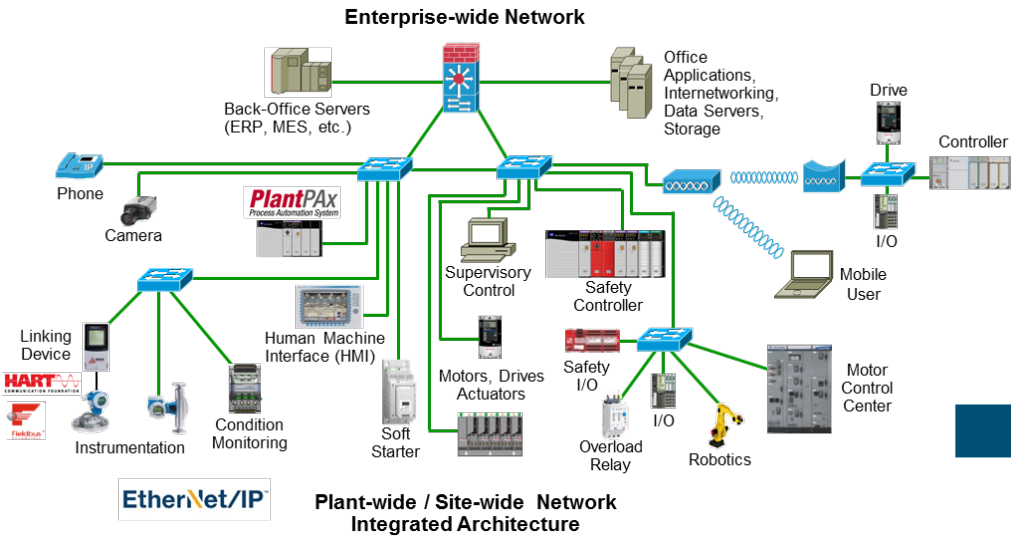


Flat, Open and Non-Resilient
Industrial Automation and Control System (IACS)
Network and Security Infrastructure

Industrial IoT (IIoT) – IACS Convergence

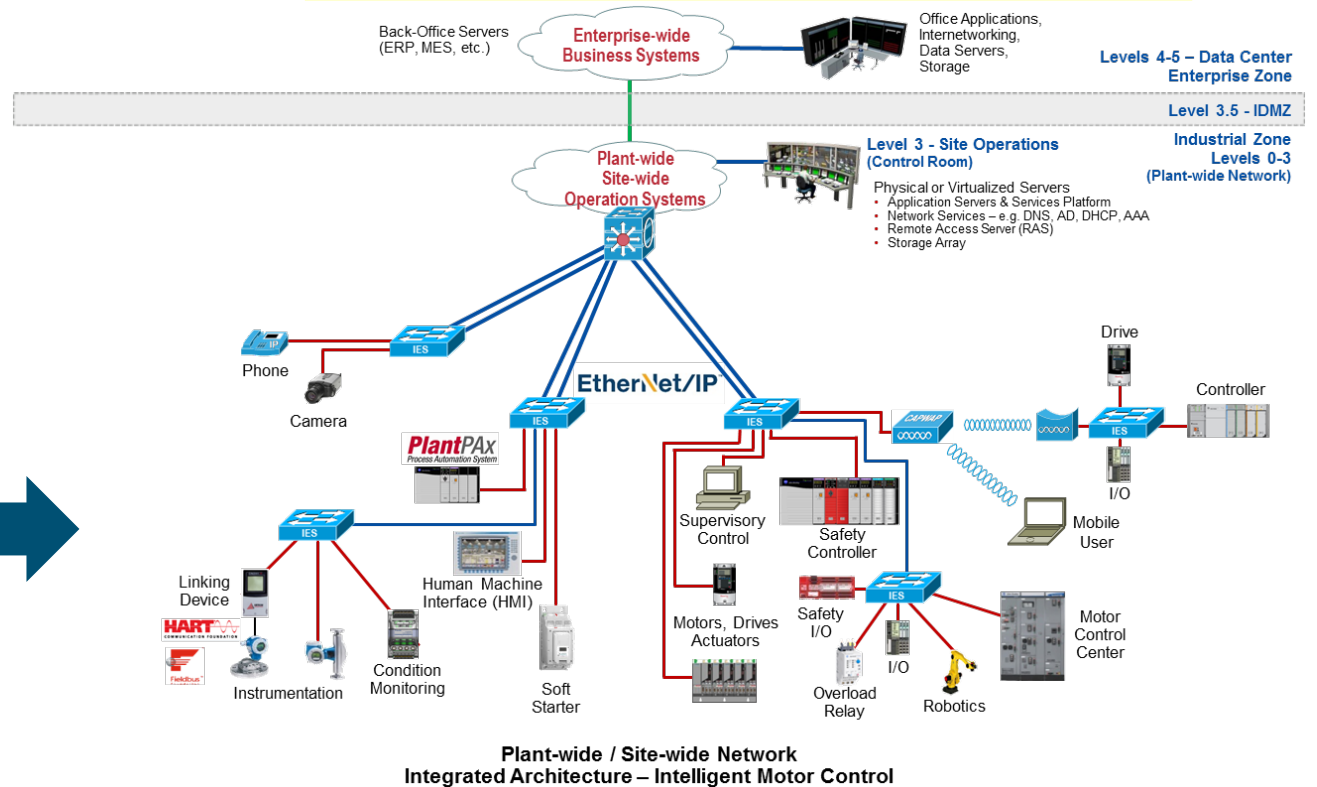
Challenges Associated with Converged Architectures that CPwE Helps to Address

Creates Larger LANs,
Lacks Natural Boundaries
and Natural Segmentation



Flat, Open and Non-Resilient
IACS Network and Security Infrastructure

Smaller Connected LANs, Creating
Boundaries and Segmentation



Structured and Hardened
IACS Network and Security Infrastructure

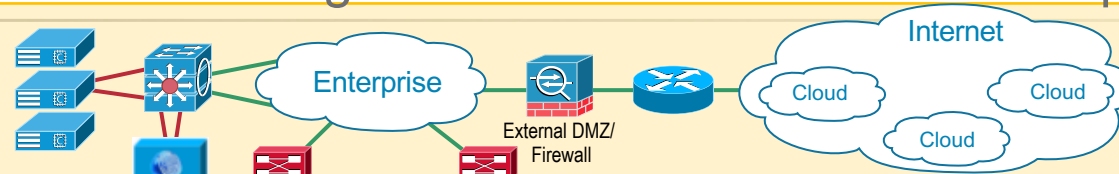
Enabling OT-IT Collaboration / Convergence / Integration



Challenges Associated with Converged Architectures that CPwE Helps to Address

Wide Area Network (WAN)

- Data Center - Virtualized Servers
- ERP - Business Systems
- Email, Web Services
- Security Services - Active Directory (AD), Identity Services (AAA), TLS Proxy
- Network Services - DNS, DHCP
- Call Manager

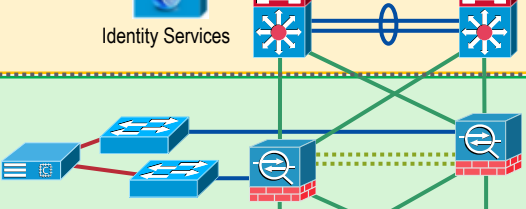


Enterprise Zone
Levels 4-5

Internet of Things Information Technology

Physical or Virtualized Servers

- Patch Management
- AV Server, TLS Proxy
- Application Mirror, Reverse Proxy
- Remote Desktop Gateway Server

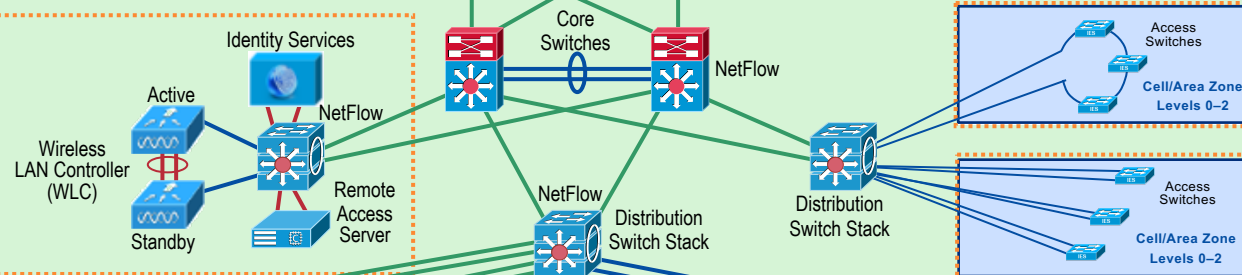


Industrial Demilitarized Zone (IDMZ)
Level 3.5

- Plant Firewalls
- Active/Standby
 - Inter-zone traffic segmentation
 - ACLs, IPS and IDS
 - VPN Services
 - Portal and Remote Desktop Services proxy

Physical or Virtualized Servers

- FactoryTalk® Application Servers and Services Platform
- FactoryTalk® Network Manager™
- Network & Security Services - DNS, AD, DHCP, Identity Services (AAA)
- NetFlow Collector - Stealthwatch
- Storage Array



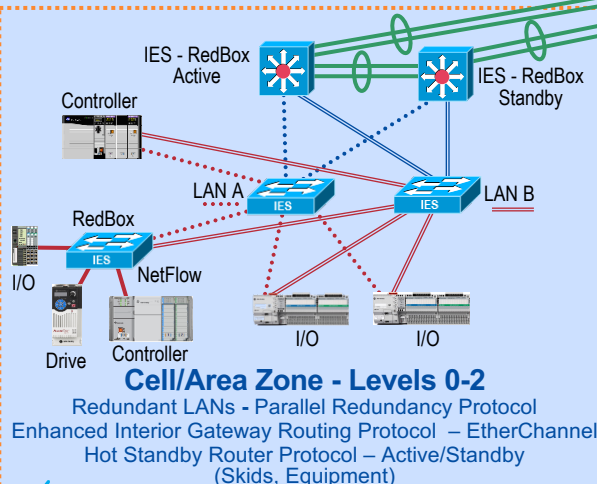
Industrial Zone
Levels 0-3
(Plant-wide Network)

Industrial IT



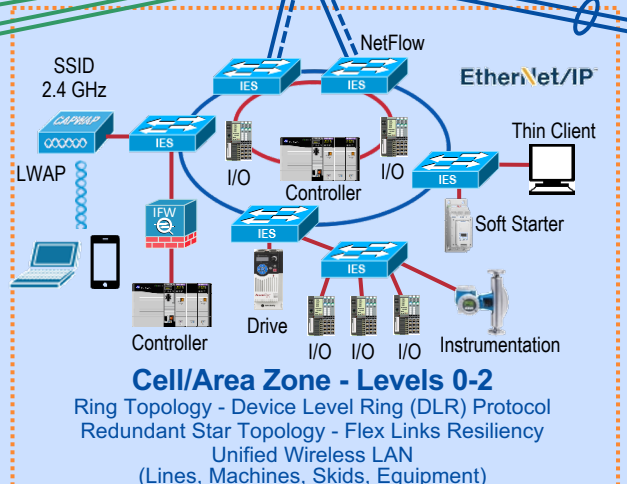
PEOPLE TECHNOLOGY PROCESSES & INNOVATION

Level 3 - Site Operations (Control Room)



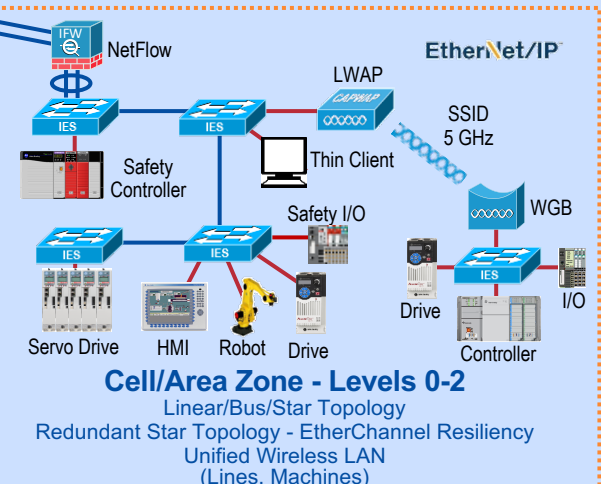
Cell/Area Zone - Levels 0-2

- Redundant LANs - Parallel Redundancy Protocol
- Enhanced Interior Gateway Routing Protocol - EtherChannel
- Hot Standby Router Protocol - Active/Standby (Skids, Equipment)



Cell/Area Zone - Levels 0-2

- Ring Topology - Device Level Ring (DLR) Protocol
- Redundant Star Topology - Flex Links Resiliency
- Unified Wireless LAN (Lines, Machines, Skids, Equipment)



Cell/Area Zone - Levels 0-2

- Linear/Bus/Star Topology
- Redundant Star Topology - EtherChannel Resiliency
- Unified Wireless LAN (Lines, Machines)

Industrial IoT Operational Technology

Customer Feedback: OT/IT Value Statements - What We Do Together

- Valued resource
 - Global Consumer Packaged Goods (CPG)
 - To help us with our own OT-IT convergence – Industrial IT
 - Proven architectures – cost reduction, risk reduction
- We've come to expect the testing and validation results
 - Global Pharmaceutical
 - Reduces our risk in deploying newer technologies
 - We adapt the CPwE blueprint into our global plant and global OEM standards
- Unique in the industry
 - System Integrator
 - No other company, organization or consortia provides the level of testing, validation and documentation that CPwE provides
 - Reduces the investment in our own test lab
 - Our go-to collateral to educate our staff on Industrial IoT and Industrial IT
- We use CPwE to help us justify network and security projects
 - Global Pharmaceutical
 - Network and security architectural framework
 - Best practices, design and implementation guidance

Prepare industrial operations for the future with CPwE to...

Together, Cisco and Rockwell Automation are leading the digital transformation towards a connected enterprise with a secure and reliable, converged network architecture that enables manufacturers to boost production yield, minimize asset risk, and enable business agility.



Enable business agility

Increase connectivity and interoperability to securely connect disparate data sources, leverage data effectively, and derive insights across the enterprise



Optimize production yield

Drive greater manufacturer efficiencies by connecting operational and business systems for end-to-end visibility and control of industrial operations



Minimize risk

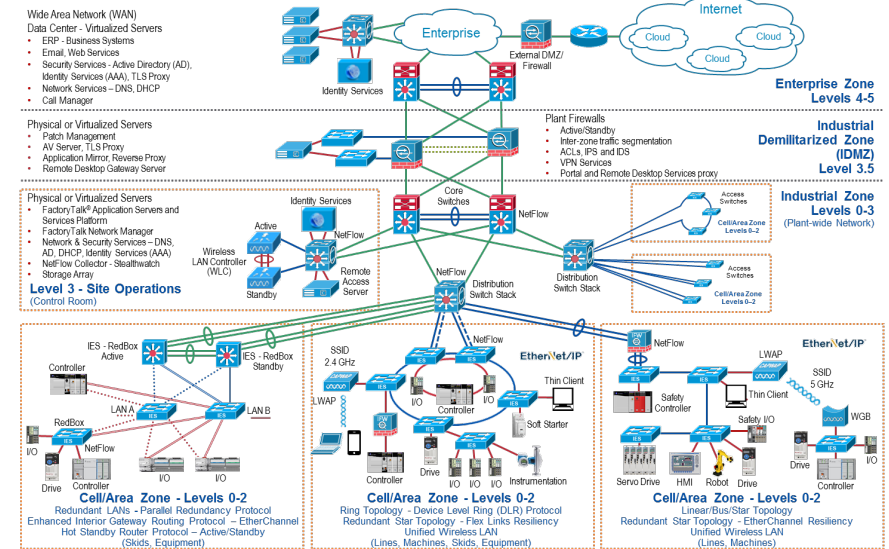
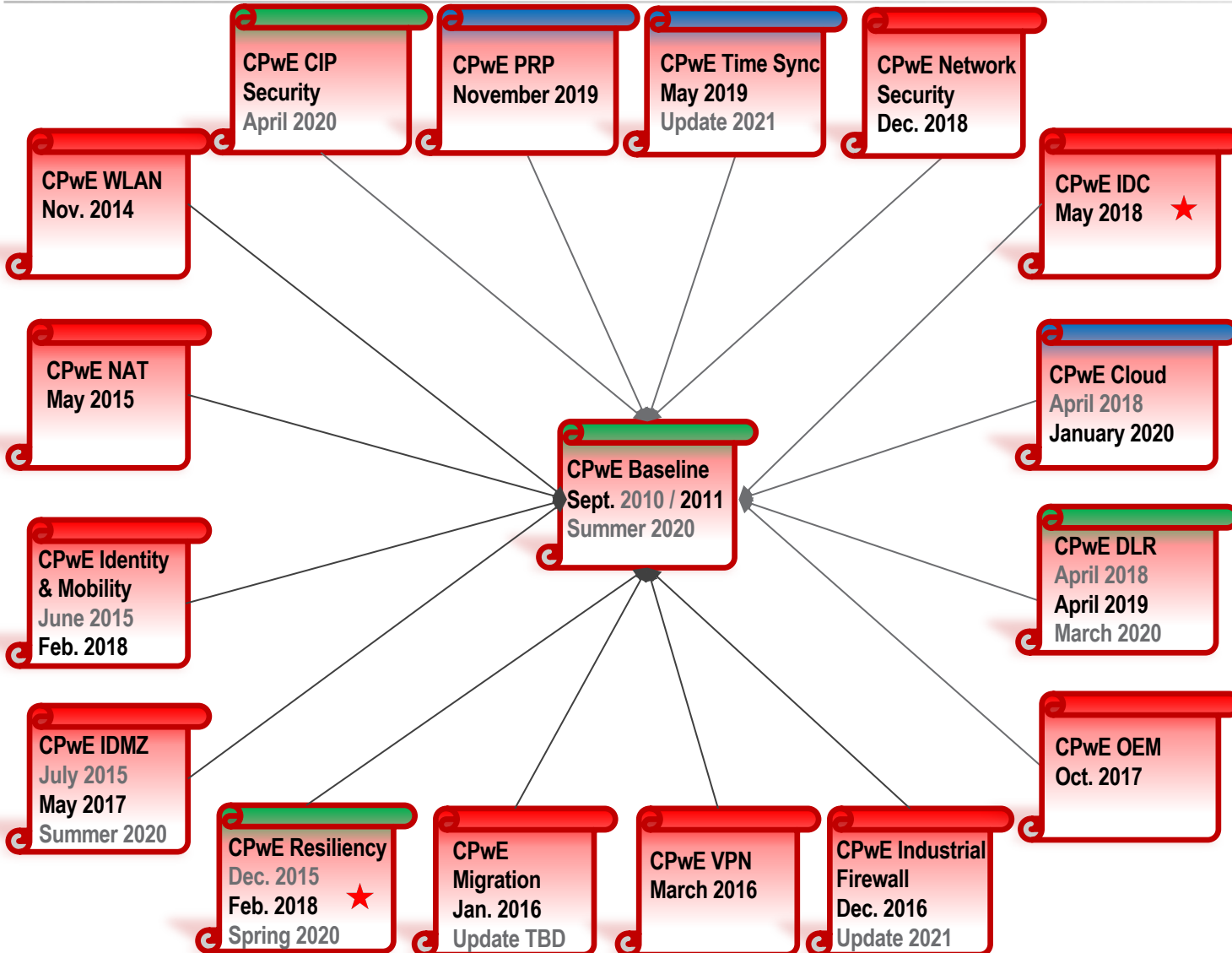
Protect physical and network assets, sensitive intellectual property, system data, and workers with a comprehensive security and safety architecture

Overview: Converged Plantwide Ethernet (CPwE) Reference Architectures

Collection of Architected, Tested & Validated Designs



Overview: Converged Plantwide Ethernet (CPwE) Reference Architectures



CPwE Test Labs

- Rockwell Automation – Mayfield Heights, OH
- Cisco – Raleigh, NC (RTP)
- Panduit – Tinley Park, IL ★

Note: not all inclusive, work in progress, subject to change without prior notice.

Collection of Architected, Tested & Validated Designs



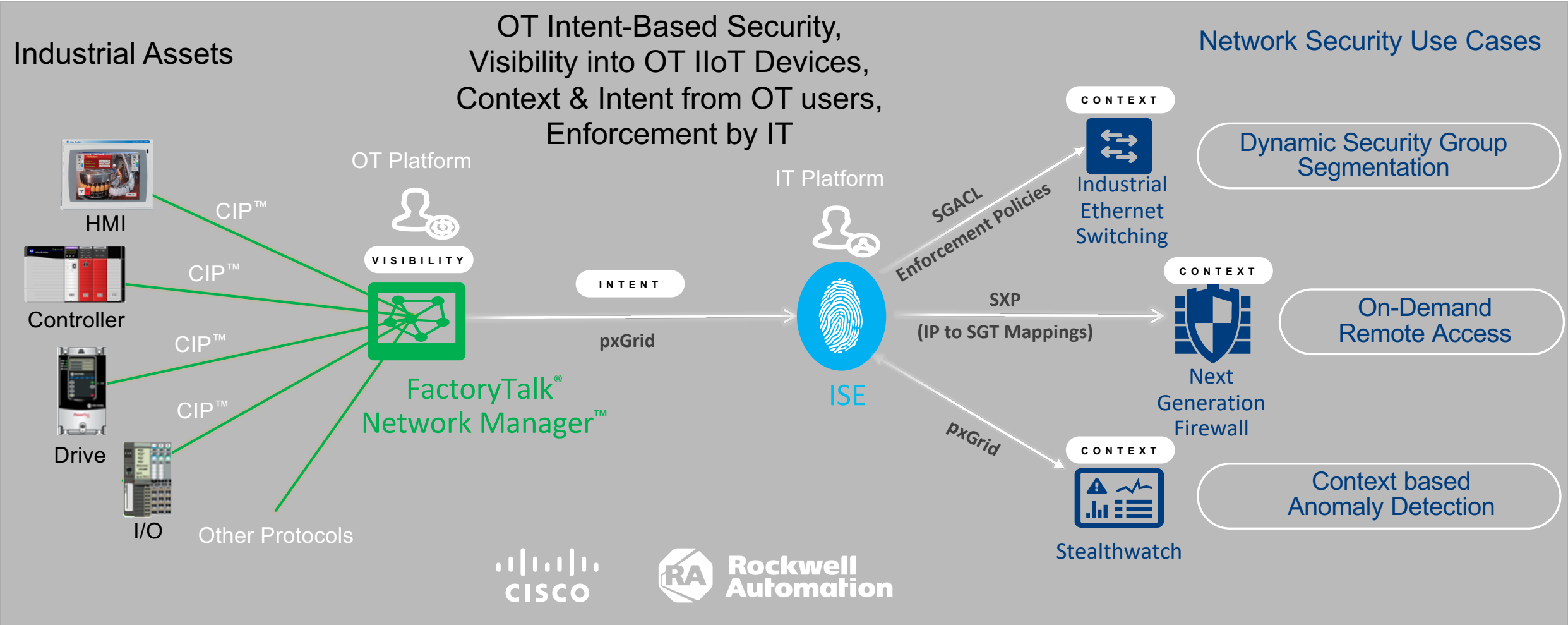
Overview: Converged Plantwide Ethernet (CPwE) Reference Architectures

Topic	Design Guide	Whitepaper
Converged Plantwide Ethernet – Baseline Document	ENET-TD001E-EN-P	N/A
Deploying 802.11 Wireless LAN Technology within a Converged Plantwide Ethernet Architecture	ENET-TD006A-EN-P	ENET-WP034A-EN-P
Deploying Identity and Mobility Services within a Converged Plantwide Ethernet Architecture	ENET-TD008B-EN-P	ENET-WP037C-EN-P
Securely Traversing IACS Data Across the Industrial Demilitarized Zone (IDMZ)	ENET-TD009B-EN-P	ENET-WP038B-EN-P
Deploying Network Address Translation within a Converged Plantwide Ethernet Architecture	ENET-TD007A-EN-P	ENET-WP036A-EN-P
Migrating Legacy IACS Networks to a Converged Plantwide Ethernet Architecture	ENET-TD011A-EN-P	ENET-WP040A-EN-P
Deploying A Resilient Converged Plantwide Ethernet Architecture	ENET-TD010B-EN-P	ENET-WP039D-EN-P
Deploying Industrial Firewalls within a Converged Plantwide Ethernet Architecture	ENET-TD002A-EN-P	ENET-WP011B-EN-P
Deploying Device Level Ring within a Converged Plantwide Ethernet Architecture	ENET-TD015C-EN-P	ENET-WP016D-EN-P
OEM Networking within a Converged Plantwide Ethernet Architecture	ENET-TD018A-EN-P	ENET-WP018A-EN-P
Cloud Connectivity to a Converged Plantwide Ethernet Architecture	ENET-TD017A-EN-P	ENET-WP019B-EN-P
Deploying Industrial Data Center within a Converged Plantwide Ethernet Architecture	ENET-TD014A-EN-P	ENET-WP013A-EN-P
Deploying Scalable Time Distribution within a Converged Plantwide Ethernet Architecture	ENET-TD016A-EN-P	ENET-WP017B-EN-P
Deploying Network Security within a Converged Plantwide Ethernet Architecture	ENET-TD019A-EN-P	ENET-WP023B-EN-P
Deploying Parallel Redundancy Protocol within a Converged Plantwide Ethernet Architecture	ENET-TD021A-EN-P	ENET-WP041A-EN-P
Deploying CIP Security within a Converged Plantwide Ethernet Architecture	ENET-TD022A-EN-P	ENET-WP043A-EN-P

Key Tenets of CPwE Architectures

OT-IT Collaboration / Convergence / Integration

Software-Defined Security Group Segmentation (Zoning)



OT-IT Collaboration / Convergence / Integration

Software-Defined Security Group Segmentation

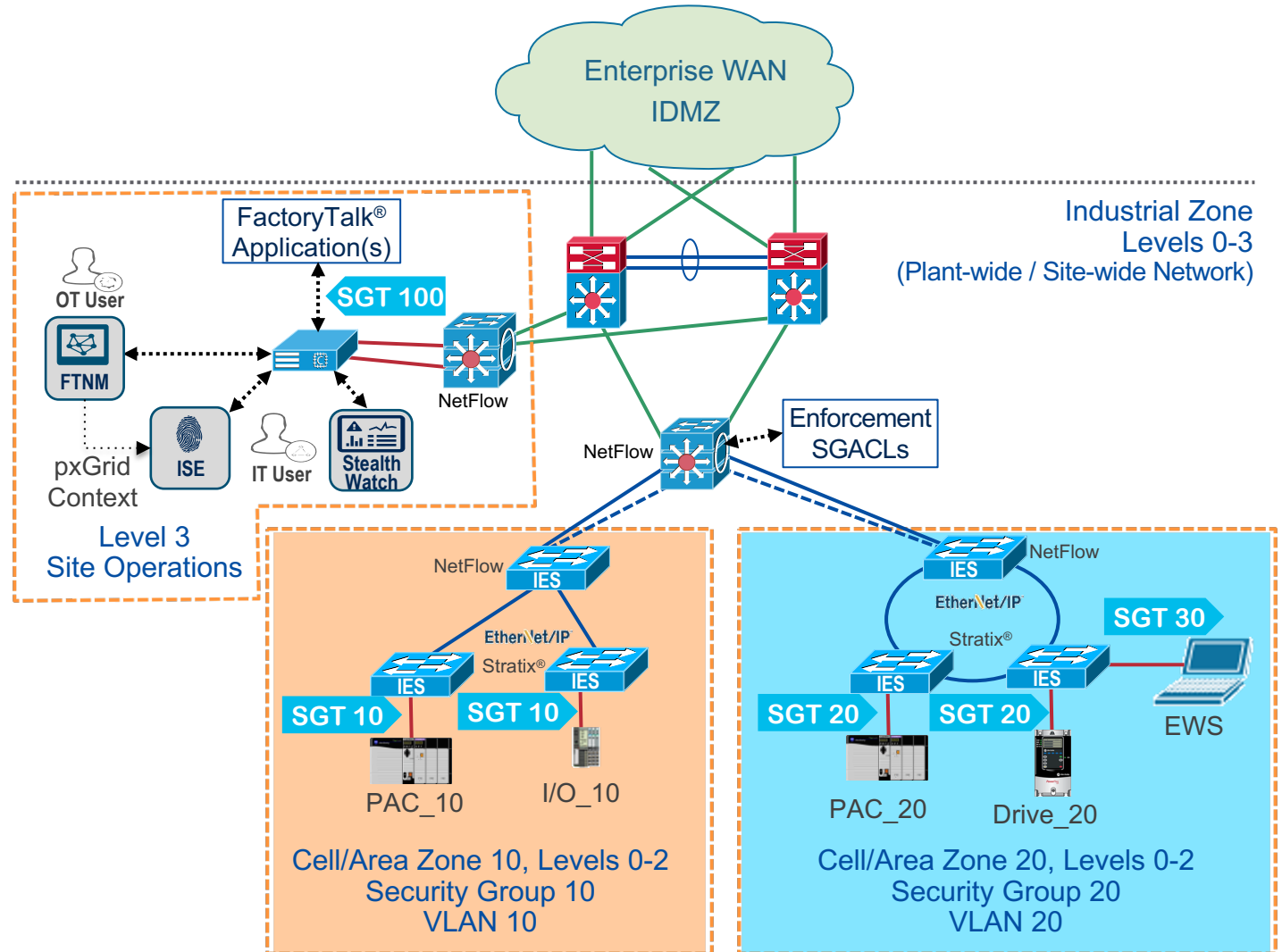


Software-Defined Security Group Segmentation

Sample SGACL Policy Table Role-based Enforcement

	SGT 100	SGT 30	SGT 10	SGT 20
SGT 100	-	N	Y	Y
SGT 30	N	-	Y	Y
SGT 10	Y	Y	Y	N
SGT 20	Y	Y	N	Y

SGT – Security Group Tag

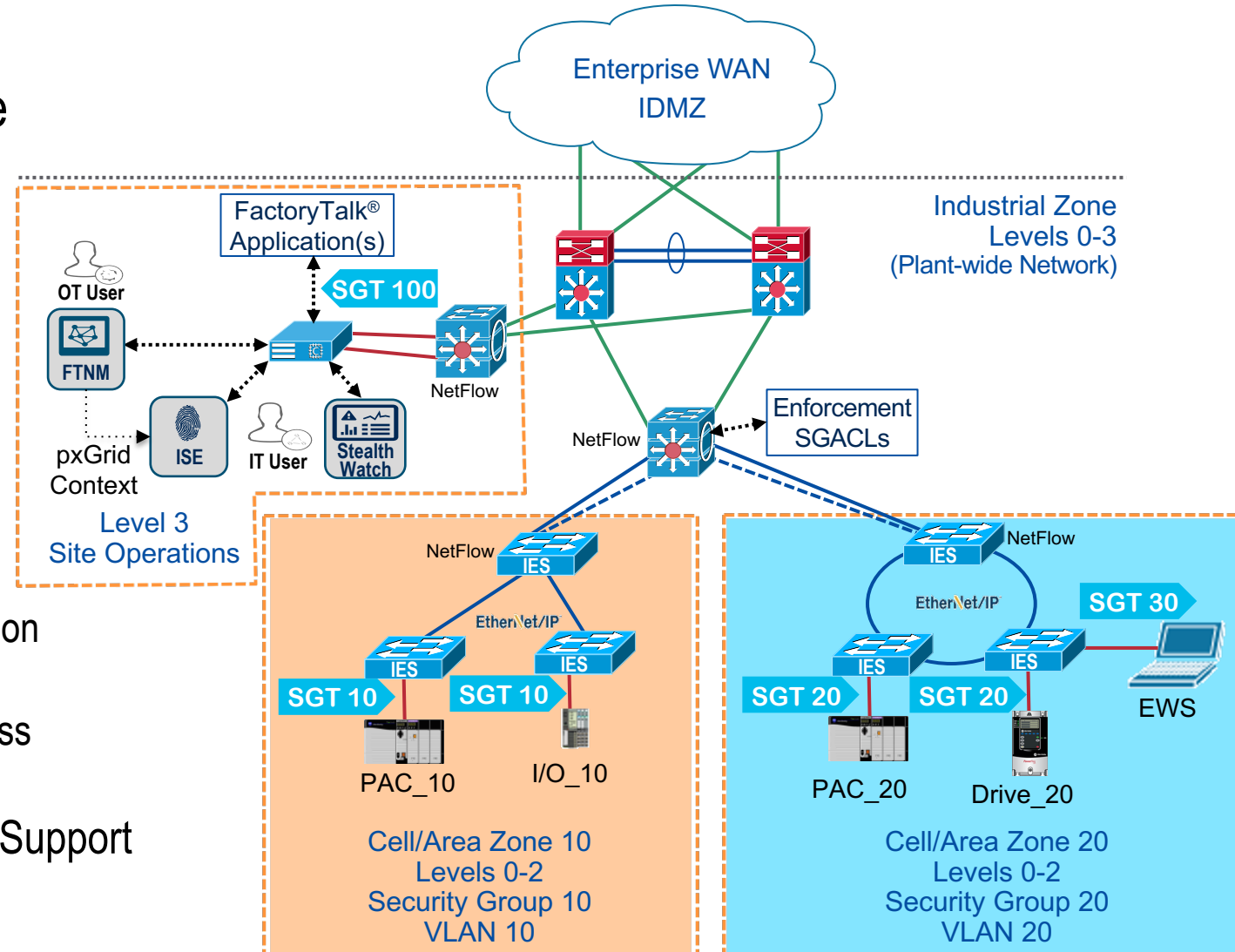


What's New?

CPwE Network Security – Released January 2019

What's New

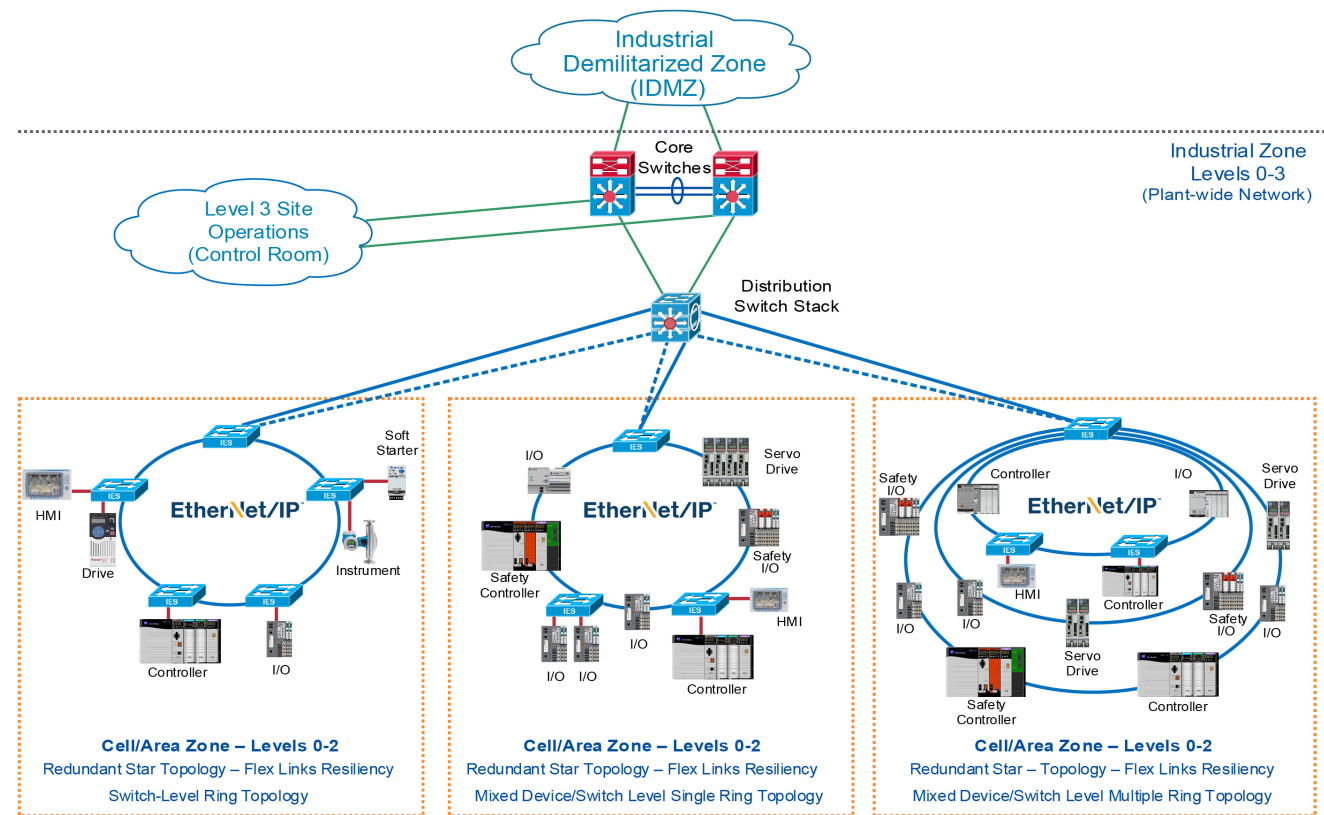
- Deploying Network Security within a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - [ENET-WP023B-EN-P](#)
 - Design & Implementation Guide – [ENET-TD019A-EN-P](#)
- Solution Overview
 - Outlines Cisco - Rockwell Automation Network Security Use Cases:
 - Visibility and Identification
 - Software-Defined Security Group Policy Segmentation
 - Network flow and threat (e.g., malware) detection
 - OT managed remote user (employee, partner) access
 - FactoryTalk® Network Manager™ software
 - Stratix® 5400 – NetFlow and Security Group Tag Support
 - Cisco TrustSec, Identity Services Engine (ISE), and Stealthwatch



CPwE DLR Phase 2 – Released April 2019

What's New

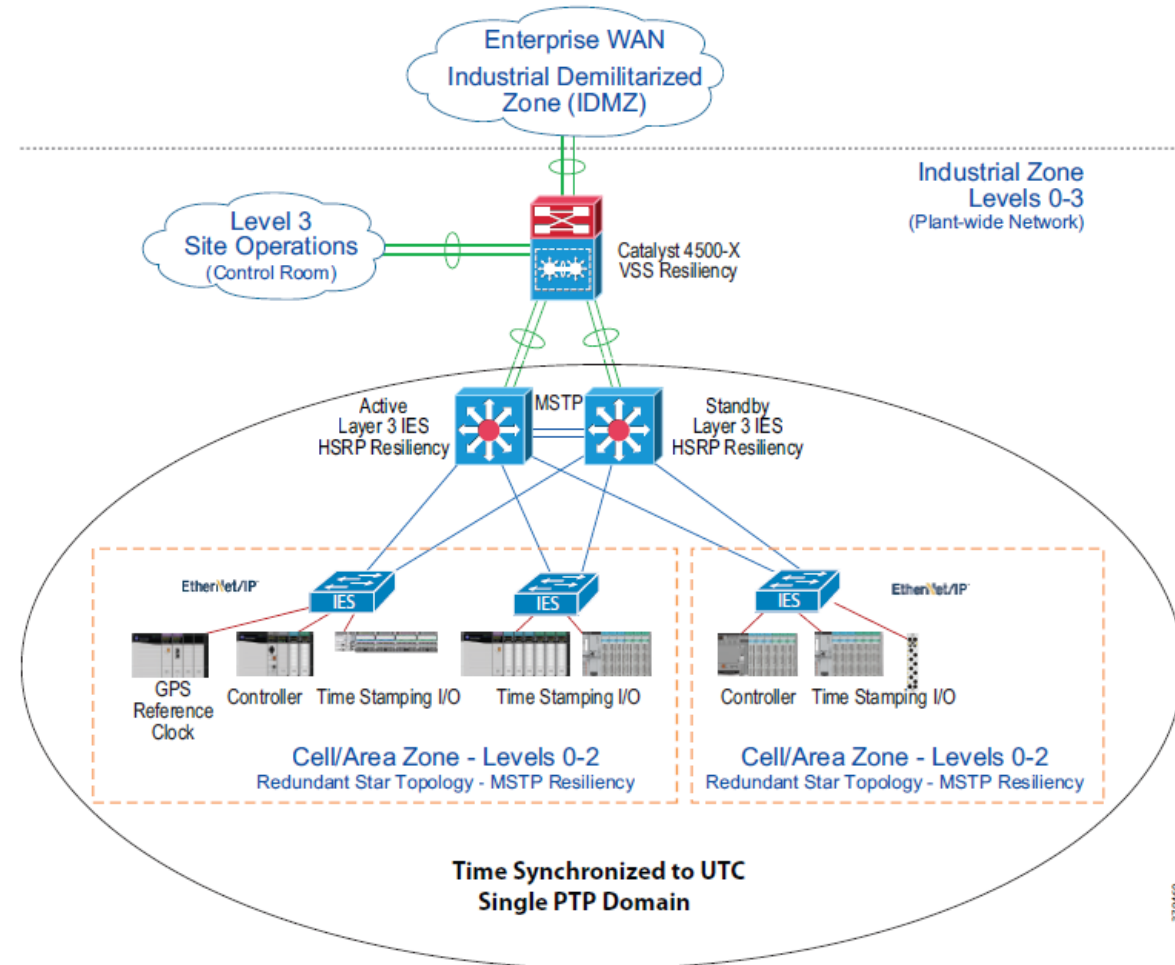
- Deploying Device Level Ring within a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - [ENET-WP016D-EN-P](#)
 - Design & Implementation Guide – [ENET-TD015C-EN-P](#)
- Solution Overview
 - Outlines several use cases for deploying DLR technology across OEM and plant-wide applications
 - Device Level Ring technology overview
 - Design and configuration considerations for plant-wide device-level, switch-level, and mixed device/switch-level DLR deployments
 - Stratix® 5400 – 1 Gbps, multiple DLR ring support.



CPwE Time – Released May 2019

What's New

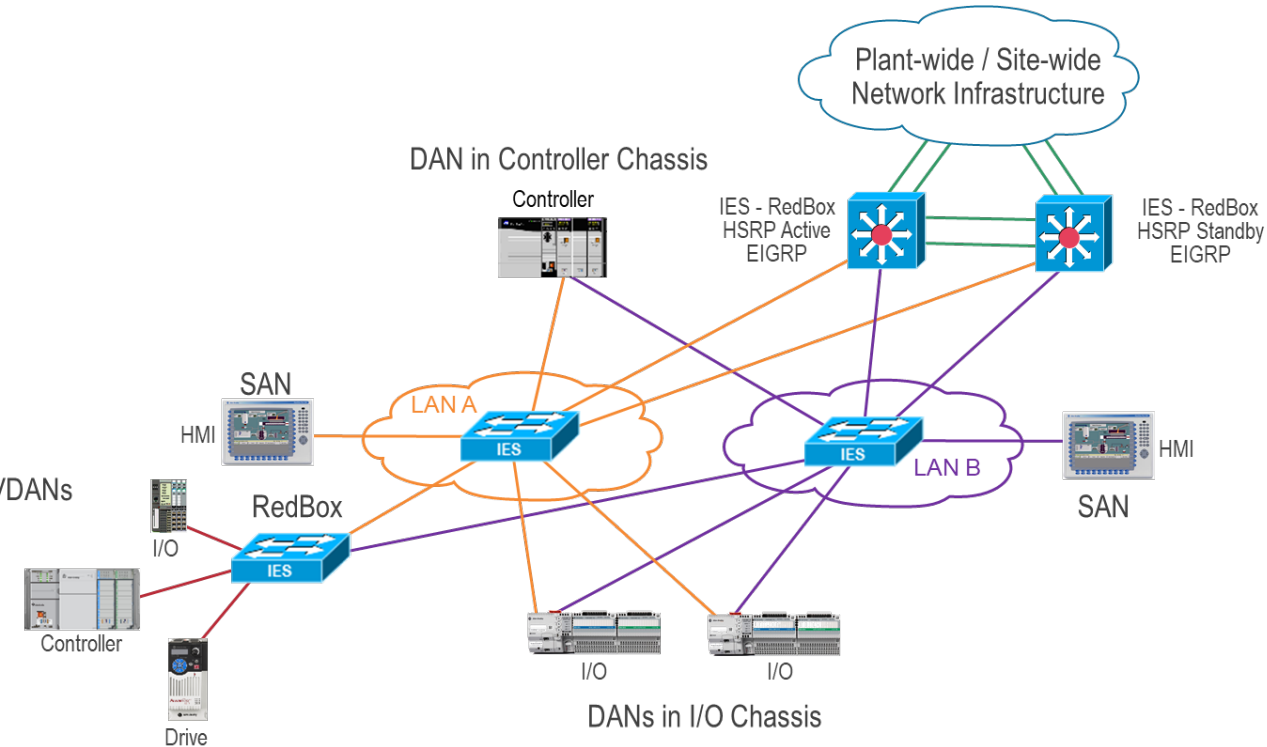
- Deploying Scalable Time Distribution within a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - [ENET-WP017B-EN-P](#)
 - Design & Implementation Guide – [ENET-TD016A-EN-P](#)
- Solution Overview
 - Outlines several use cases deploying IEEE 1588 PTP and CIP Sync™ technology throughout a plant-wide IACS network infrastructure
 - Time Synchronization Overview
 - Design and configuration considerations for plant-wide (Levels 0-3) IEEE 1588 PTP and CIP Sync deployments.
 - Stratix® 5700/5400/5410; 1756-TIME module



CPwE PRP – Released November 2019

What's New

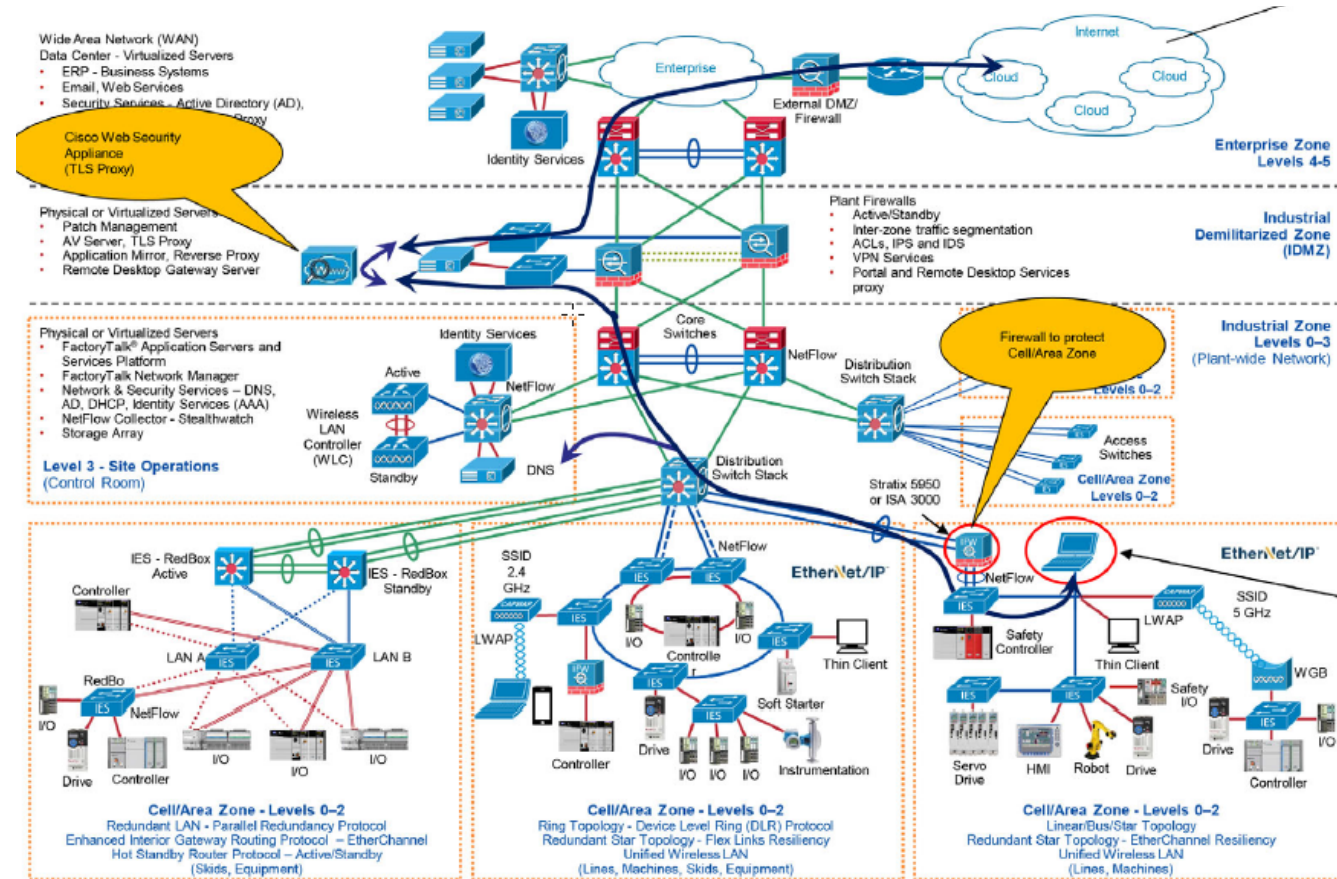
- Deploying Parallel Redundancy Protocol within a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - [ENET-WP041B-EN-P](#)
 - Design & Implementation Guide – [ENET-TD021A-EN-P](#)
- Solution Overview
 - Outlines several use cases for deploying PRP technology with redundant network infrastructure across plant-wide IACS applications
 - Parallel Redundancy Protocol technology overview
 - Design and configuration considerations for plant-wide IACS PRP deployments
 - Stratix® 5400 as Redundancy Box, 1756-EN2TP, 5094 I/O



CPwE Cloud Connectivity Phase 2 – Released January 2020

What's New

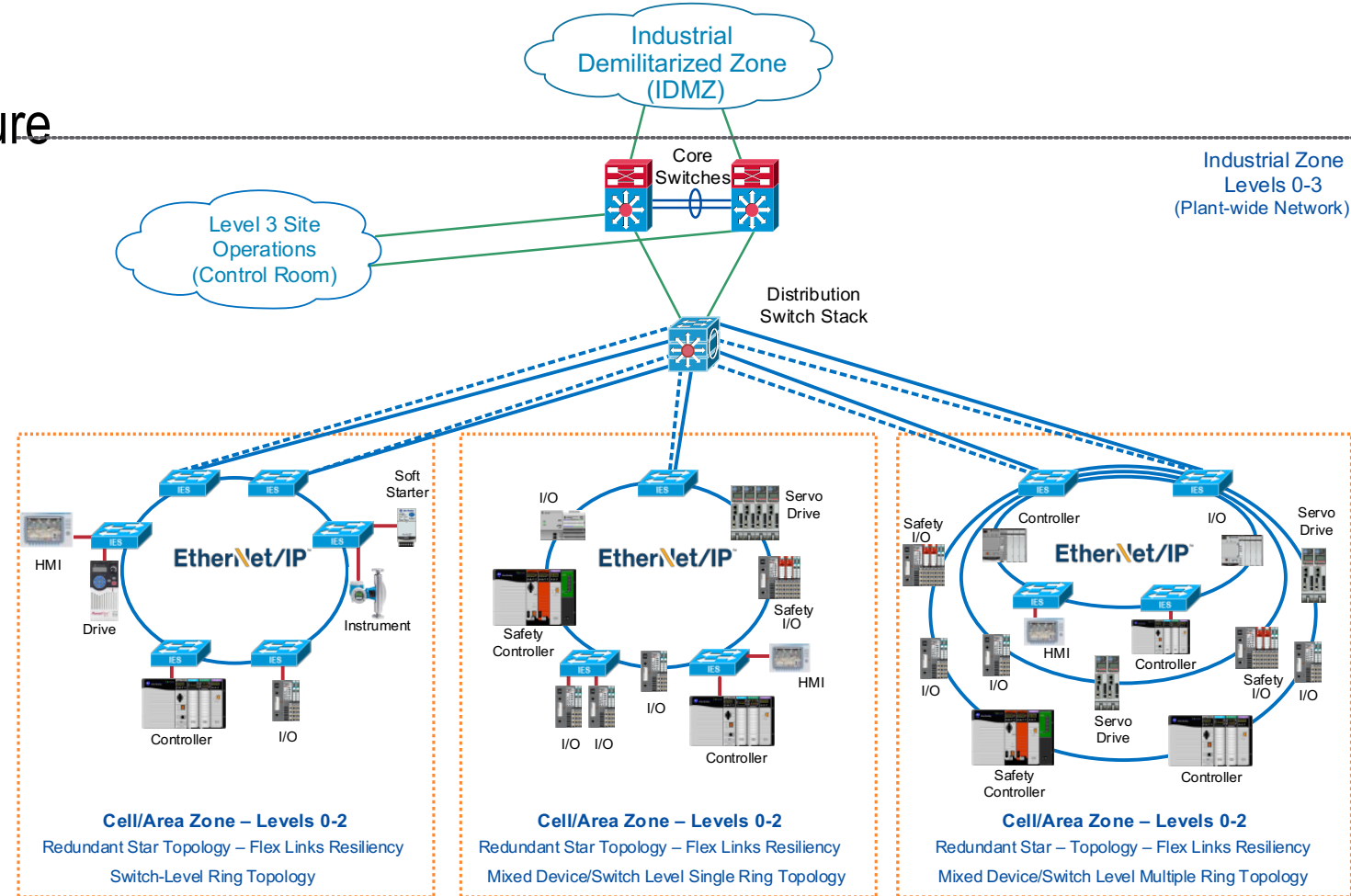
- Cloud Connectivity to a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - [ENET-WP019C-EN-P](#)
 - Design Guide - [ENET-TD017B-EN-P](#)
- Solution Overview
 - CPwE Cloud Connectivity outlines several security architecture use cases for designing and deploying restricted end-to-end outbound connectivity with FactoryTalk applications from industrial operations to the Rockwell Automation cloud within a CPwE architecture
 - Platinum, Gold, Silver, and Bronze
 - Migration from Application Guide to Cisco Reference Design (CRD)
 - Addition of Cisco Web Security Appliance (WSA) and related infrastructure configuration



CPwE DLR Phase 3 – Planned Release March 2020

What's New

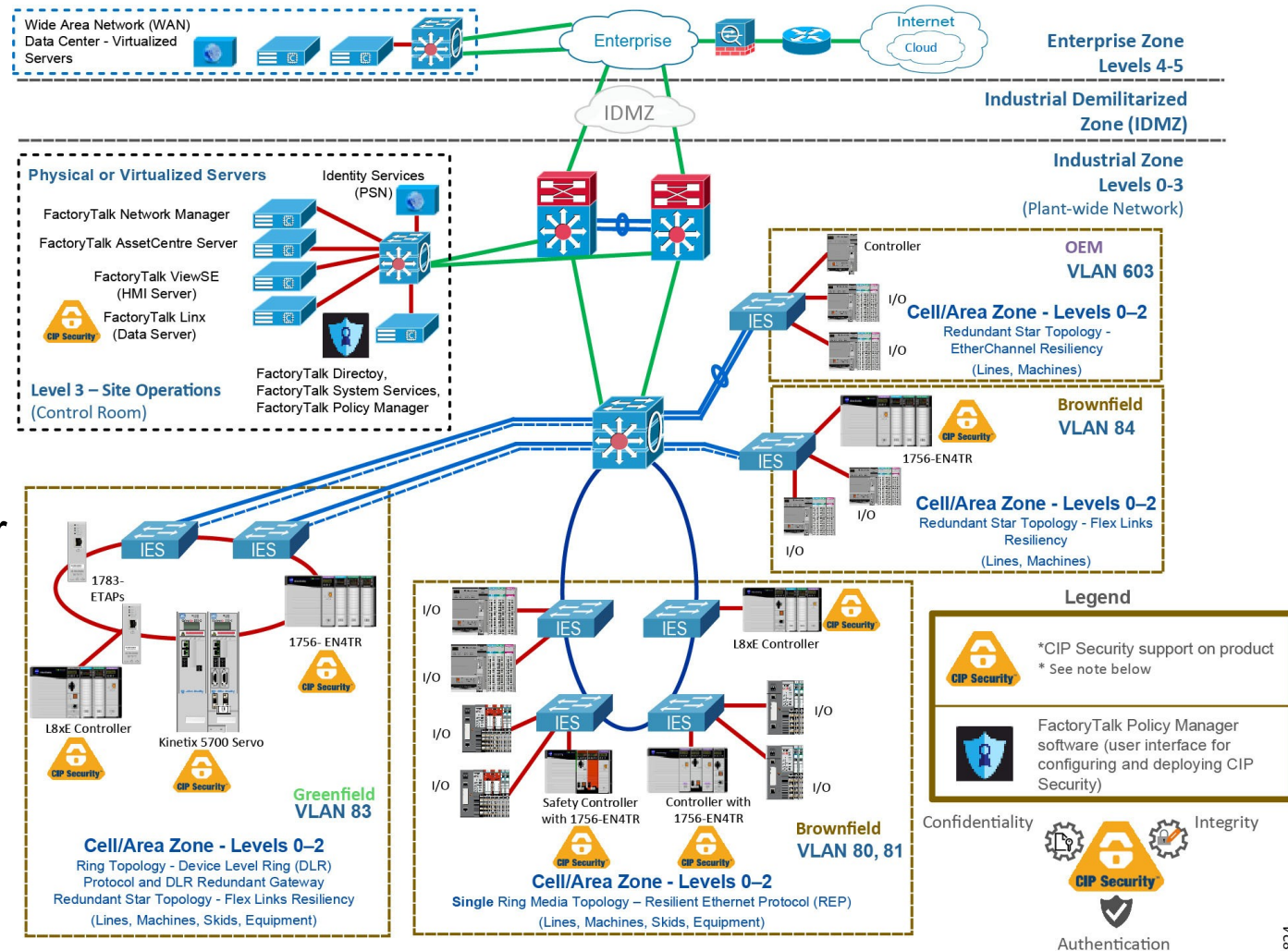
- Deploying Device Level Ring within a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - [ENET-WP016E-EN-P](#)
 - Design & Implementation Guide – [ENET-TD015D-EN-P](#)
- Solution Overview
 - Outlines several use cases for deploying DLR technology across OEM and plant-wide or site-wide applications
 - Design and configuration considerations for plant-wide device-level, switch-level, and mixed device/switch-level DLR deployments
 - Stratix DLR Redundant Gateway; combination of mixed rings



CPwE CIP Security – Planned Release April 2020

What's New

- Deploying CIP Security within a Converged Plantwide Ethernet Architecture
- CPwE Collateral
 - White Paper - ENET-WP043A-EN-P
 - Design Guide – ENET-TD022A-EN-P
- Solution Overview
 - Outlines several use cases for deploying CIP Security™ technology across OEM and plant-wide or site-wide applications
 - CIP Security technology overview
 - FactoryTalk® Policy Manager
 - Design and configuration considerations for solution use cases with focus on the System IEC 62443-3-2 and 3-3 sections of the series which address requirements at the system level.



Key Take Aways

Key Takeaways

- Cisco / Rockwell Automation® Strategic Alliance
 - Over 13 Years of Collaboration
- Collection of over 17 architected, tested and validated designs delivering:
 - Architectural Best Practices
 - Design and Implementation Considerations
 - Documented Test Results and Configurations
 - Multiple Disciplines – Industrial IoT, Zoning (segmentation), Unified WLAN for Mobility, Industrial Security and Cloud Connectivity
- Proven Reference Architectures
 - Prepare industrial operations for the future:
 - Helping to enable business agility, optimize production yield and minimize risk
 - Helps customers to reduce their costs by:
 - Simplifying customer design, enabling quicker customer deployment, and reducing customer risk in deploying newer technologies
 - Enables OT-IT Collaboration and Convergence:
 - Reliable and Secure Industrial IoT Architectures
 - Industrial IT (bridging OT-IT)
 - Content relevant to both OT and IT personnel
- Expanded CPwE Ecosystem, collaboration with Panduit on reliable physical infrastructure

Key Takeaways

- Business outcomes drive modernization projects
 - Agility to quickly adapt to new market trends (future-ready)
 - Cost reduction through lower MTTR and higher OEE (reliability, safety, and security)
 - Risk reduction – reliable and secure plant-wide architectures based on proven reference architectures
- Assessment, design and planning are key steps to modernizing aging network infrastructure
 - Know where you are starting from
 - Have a vision, based on business drivers, for scalable, reliable, safe, secure, and future-ready Industrial IoT architectures
- Standard and open managed network and security services enable modernization
 - Zoning through Segmentation
 - Virtual Local Area Networks (VLANs)
 - Switch Hierarchy – Layer 2/Layer 3
 - Network Address Translation (NAT)
 - Connected Routing
- Stratix® managed infrastructure devices – best of OT/IT, best of Rockwell Automation/Cisco, enabling reliable and secure Industrial IoT architectures
- Converged Plantwide Ethernet (CPwE), collection of architected, tested, and validated designs

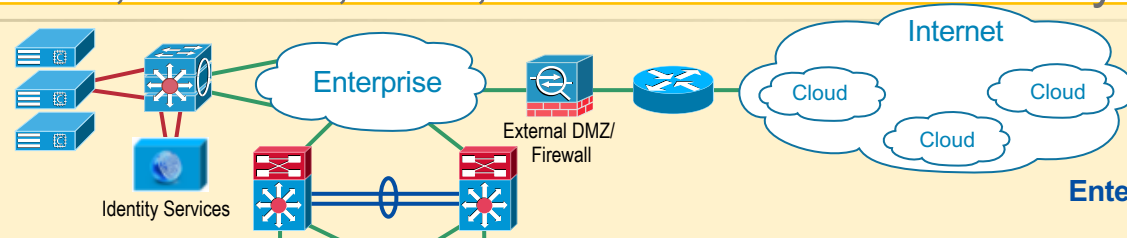
CPwE - Enabling Industrial IoT and Industrial IT (Bridging OT-IT)

Key Takeaways - Scalable, Reliable, Safe, Secure and Future-Ready Industrial IoT Architectures

Wide Area Network (WAN)

Data Center - Virtualized Servers

- ERP - Business Systems
- Email, Web Services
- Security Services - Active Directory (AD), Identity Services (AAA), TLS Proxy
- Network Services - DNS, DHCP
- Call Manager



Enterprise Zone
Levels 4-5

Internet of Things Information Technology



Physical or Virtualized Servers

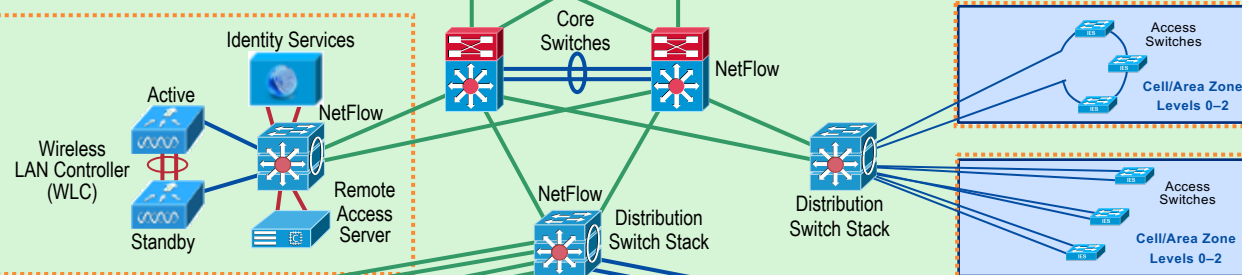
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Industrial Demilitarized Zone (IDMZ)
Level 3.5

Physical or Virtualized Servers

- FactoryTalk® Application Servers and Services Platform
- FactoryTalk Network Manager
- Network & Security Services - DNS, AD, DHCP, Identity Services (AAA)
- NetFlow Collector - Stealthwatch
- Storage Array

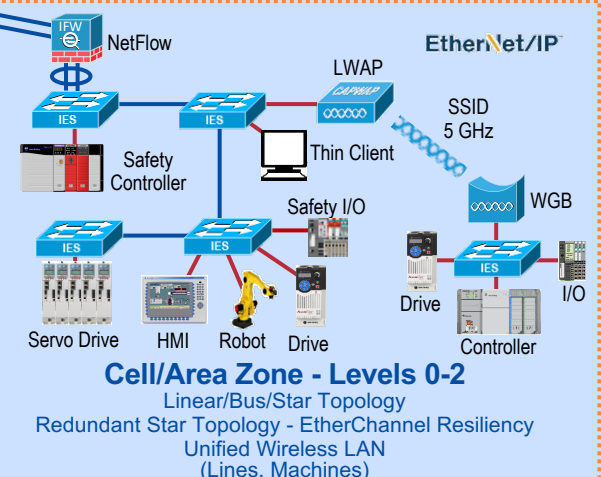
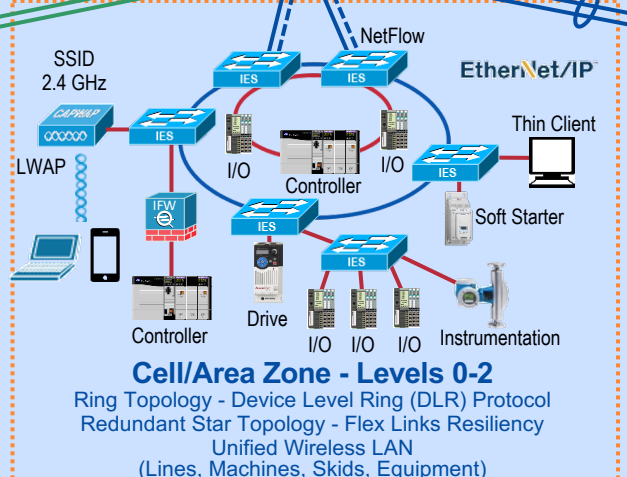
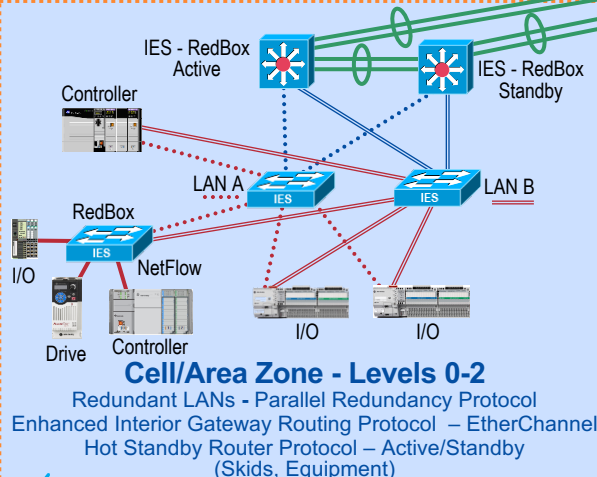


Industrial Zone
Levels 0-3
(Plant-wide Network)

Industrial IT



Level 3 - Site Operations
(Control Room)



Industrial IoT Operational Technology



Thank you for attending

TRC Tech Talks

Online Seminars